

afternoon, remarked that it must have been a great pleasure to him to read the friendly greetings, he replied: "I have not read them yet. I must work now. This evening I shall have time to read them."

To speak of his hospitality might, in some connections, appear ungracious. But here, as botanists, we may touch upon a subject associated by us, especially, with so many tender recollections. When we heard that Prof. Gray was dead we recognized the irreparable loss to American botany in the death of its leader, but our first thoughts turned to the happy home now so deeply afflicted, and we recalled the bright days when all were welcomed with a sincere and hearty greeting. No matter whether a titled foreigner, or a poor, and perhaps friendless, student from our own land, all botanists were welcomed with the same unostentatious hospitality, guided by that intuitive delicacy which anticipates the wishes of others, and draws timidity from its reserve. Many, many botanists now count among their happiest hours those spent at the old house in Cambridge, and, with sorrow mingled with gratitude, sincerely hope that their sympathy may prove, in some measure, a consolation to his bereaved wife, his companion for many years, his counterpart in all that is gentle, true and noble. For a while we may think only of what we have lost, but when time shall have blunted the edge of our sorrow we shall recognize that the best part of a well-spent life is the fragrant memory which it leaves behind.

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Iowa Peronosporæ and a dry season.

BYRON D. HALSTED.

The readers of the BOTANICAL GAZETTE who are interested in the downy mildews and their allies may desire to learn of some observations made upon this group of destructive parasites in connection with a season of excessive dryness. For the last two years central Iowa has been visited by a drought unequalled in the history of the state, a drought which not only rendered the meadows and pastures brown and lifeless in midsummer, but was so prolonged as to empty the "never-failing" wells and dry up streams of considerable size.

There is, perhaps, no better way of treating the subject than that of taking up the species of the group, one by one, in the order in which they are given in Dr. Farlow's paper upon the "Enumeration of the Peronosporæ of the United States," which was published in the GAZETTE for November, 1883, and to which additions were made in March, 1884.

Phytophthora infestans DBy. No signs of this rot of the potato have been observed the past season. Two years ago was an average one, and there were many complaints from all parts of the state. More than half of the potatoes in some sections rotted either before they were dug or while being stored for winter use. Tubers from the college gardens and root-houses showed the rot fungus. Last year there was very much less, and this season there has been entire freedom from the disease in this locality.

Peronospora viticola DBy. Two years ago the wild canes of *Vitis riparia* were, in some instances, dwarfed and covered with a thick felt of white down to the earth surface. None of this mildew has been found the past season, although the search for it was frequently made in the same places where it was so violent in its attacks two years before. No signs of the mildew could be found in the large college vineyard, where many sorts of cultivated grapes and a few scattered vines of the wild species are grown.

Peronospora Halstedii Farl. is the most common species of this vicinity. Its hosts are numerous, the leading ones of which are several species of *Helianthus*, *Silphium*, *Eupatorium* and *Bidens*, and a very long list of other genera, all of the order *Compositæ*. Last season *Helianthus grosseserratus* was added to the host list of this vicinity, and this season *Bidens connata* var. *comosa* was found infested. Two years ago specimens of this species were found at almost any time. Last season it was only moderately common, but this year it has been found growing only upon those composites which thrive in wet places. It has been rare upon *Helianthus*, not found at all upon *Ambrosia artemisiæfolia*, *Solidago Canadensis* or *Eupatorium* and *Silphium* species. In short, the genus *Bidens* has been the only one which could furnish any considerable supply of the species. *Bidens frondosa*, *B. chrysanthemoides* and *B. connata* were infested, but only those plants which were found in moist places and exhibited a rank growth of succulent herbage.

Peronospora obducens Sch. upon *Impatiens fulva*, although

found in small quantities in ordinary seasons, has not been met with the past year.

Peronospora Geranii Pk. upon its common host, *Geranium maculatum*, has not been observed this year; but in May Mr. A. S. Hitchcock collected it upon *G. Carolinianum* at Iowa City, and thereby adds a new host for the state. It was not at all common.

Peronospora pygmæa Unger on Anemones has not been obtained this year.

Peronospora gangliformis DBy. was very "shy," as the horticulturist might say. Occasionally it appeared upon the lower leaves of *Mulgedium leucophæum*. The *Nabalus albus* and species of *Lactuca*, which are hosts, grow mostly upon dry ground, and in their dwarfed condition the present year were spared the inroads of the mildew.

Peronospora parasitica Tul. is one of our most common species upon various cruciferous hosts. In ordinary seasons *Lepidium Virginicum* is much infested and has its branches strangely distorted. This year the pepper-grass has been quite free from attacks, excepting the seedlings, which, for a few weeks in spring, were badly infested. This species lives over the winter in these seedlings, and when the spring comes the mildewed plants communicate the trouble to other plants by means of the multitudes of conidial spores. The vigor of its attacks upon the young pepper-grass makes this mildew one of the useful weed-destroyers. It deals in the same way with the shepherd's purse. During the present season only a small percentage of the usual amount has been observed. Of all the hosts, it has been the most abundant upon *Nasturtium palustre*. During June the lower leaves of this host, lying close upon the moist ground, on the borders of streams, were quite generally attacked. A little later, when the drought had progressed farther, it was not at all abundant. In some specimens examined the conidiophores were not more than one-fourth the normal size. Other parts of the same patch, however, showed all gradations, and it may be observed that a leaf parasite may be dwarfed as well as its host.

Peronospora Potentillæ DBy. was common on *Potentilla Norvegica* early in the season, where the host was growing on the sloping borders of low, wet places. It soon disappeared as the dry weather of late spring arrived.

Peronospora Claytoniæ Farl. is a recently described species, and has not been seen in Iowa. It was abundant in

southern California, near Santa Barbara, where, during last winter, the writer found it upon the leaves of *Claytonia perfoliata*, but only where the host was growing luxuriantly in damp shady places. Another new host is a species of *Calandrinia*, upon which the same mildew was found in abundance. This low *Calandrinia*, probably *C. Menziesii*, grows in open dusty stubble-fields. It must, however, be remembered that this host is the purslane, so to speak, of the western coast, and is a succulent plant which is full of moisture and bathed by the heavy dews of that region. Even though the host thrives in the dust, the parasite is by no means a lover of dryness. It was also observed that the most thrifty mildew was upon the best watered and shaded plants.

Peronospora Arthuri Farl. was common enough on *Cenothera biennis* in 1885, but the past year it was found on only a few plants, and they were growing in a rich, moist, shady situation. The year before it was more abundant, and was found at Manitou, Colorado. The single infested plant grew in Englemann's Cañon, in a spot where the hot drying sun rarely reached it.

Peronospora effusa Rabh. is usually abundant upon *Chenopodium album*, but has been rare for the last year.

Peronospora Polygoni Thuem. is far from common with us on *Polygonum dumetorum*. Mr. Hitchcock found a few specimens upon *P. aviculare* at Iowa City, in May, 1887, and thereby adds another host for the state.

Peronospora alta Fcl. has been almost entirely absent from *Plantago major* for the last year. In 1885 it was one of the first of its family for the students to find on their collecting tours.

Peronospora Trifoliorum DBy. has heretofore been a common species upon *Astragalus Canadensis*, and especially on *Vicia Americana*. Upon the latter it was so abundant two years ago as to almost destroy the host in whole patches. This year it was obtained only after long search in the moistest place in which the vetch will grow.

Peronospora Euphorbiæ Fcl. is a species which quickly diminishes in times of drought. It is not uncommon on *Euphorbia maculata* in a wet season, but has been rare, indeed, for the past two years. A new host, *E. serpyllifolia*, was added last year by Mr. Hitchcock, who found it at Jewell Junction.

Peronospora leptosperma DBy. was easily collected in 1885, on both *Artemisia biennis* and *A. Ludoviciana*. Dur-

ing the present season it has been met with only a few times on *A. biennis*, growing in moist places, in cuts along a railroad track, and only in small scattered patches upon the lower leaves.

Peronospora sordida Berk. has been a good illustration of the influence of moisture upon the development of mildew. The host, *Scrophularia nodosa*, is a common plant on the banks of streams, especially when the slope is steep and without sod. The *Peronospora* was frequently looked for, but it appeared in its usual abundance in only one place, and this was at a bend in a stream, where the host grew close to the water and tall rubber boots were required to carry the collector over dry-shod.

Peronospora Lophanthi Farl. on *Lophanthus scrophulariæ-folius* is a rare species in the state, and was not found at the college before the present year. It can not, therefore, be used as an element in the argument in considering the influence of dry weather upon the prevalence of *Peronosporæ*.

Peronospora graminicola Schroeter, which was abundant last year upon *Setaria viridis*, transforming the inflorescences of this useless grass into strange shapes, has been far less common the past season. Not more than one-tenth as much was found this year upon the same area, namely, a young cherry orchard, left under the same culture as last season. It was, however, discovered this year upon Hungarian grass (*Setaria Italica*), where it distorted the host in the same manner as on the foxtail, as illustrated in the GAZETTE, XI. 272. What the mildew may do in a moist year is only conjecture, but the species now comparatively new to America may prove a serious hindrance to the growth of one of our leading forage crops, and there is danger of its spreading to other standard cultivated grasses.

Peronospora calotheca DBy., not in Dr. Farlow's lists, is ordinarily frequently met with upon species of *Galium*. This season it was not found until October 14, when it was collected in abundance upon seedling bed-straws, which had come up in a rich mold since the September rains. This seems like a clear instance of fresh-growing plants being favorable for the development of the *Peronosporæ*.

The genus *Cystopus* has four known species in the state.

Cystopus candidus Lév., like *Peronospora parasitica*, is confined to the *Cruciferae*, and like it, also lives over the winter within the tissue of seedling plants which spring up in autumn. This has been observed in particular with shep-

herd's purse, and it may help to explain the absence of oöspores in this host. It is not unreasonable to suppose that a form of fruiting may be omitted when it is not essential for the continuation of the species, as has been shown to be true in species of Uredineæ. There was an abundance of the *Cystopus* on *Capsella* early this spring, because the late rains of last year permitted the seedlings to make a good growth, and become thoroughly infested before the season closed. This spring these same plants grew and produced a large crop of spores, which probably would have rapidly spread to other plants had not the dry weather prevented. In June there was very little of the mildew. It was fairly abundant upon *Lepidium Virginicum* in early spring, but soon disappeared. Two years ago, in a fairly moist year, the inflorescences (flowers, seed-vessels, etc.) of the garden radish were very generally attacked, and often distorted beyond recognition. This season none of this mildew was found in similar situations. Late in October it was collected in quantity upon young plants of *Sisymbrium officinale*, which had developed in a moist shady place, after the rains of early September.

Cystopus cubicus Lév. is the least common species of the genus, and for the last two years has been comparatively rare. At distant intervals it was found upon *Ambrosia artemisiæfolia*.

Cystopus Bliti Lév. occurs upon an increasing list of hosts. Up to the present year it was known in the United States on *Amarantus hybridus*, *A. retroflexus*, *A. blitoides* and *Acnida cannabina*. The additional hosts for 1887 are *Amarantus albus* and *Montelia tamariscina*. Upon both these new hosts the mildew was far from rare. The *Montelia* grows only in low moist ground, and what effect a wet season may have upon the abundance of its parasite remains to be determined. The host most commonly infested is *Amarantus blitoides*. This low-spreading weed grows in dry places, even upon gravelly paths and roadways. It is, however, a thick, rather succulent-leaved plant, and, like the garden purslane, is itself full of moisture, even though the surroundings are arid. Nevertheless, it was observed that the greatest development of the mildew appeared upon plants which were most favored with moisture and shade.

Cystopus Portulacæ Lév. is the last species of our list, and one of no little importance in its bearing upon the question in hand. At first sight, it seems to give evidence contrary

to that of the other species of the group. It seems to have been more abundant during the last season than ever before, but we must remember that its host, *Portulaca oleracea*, is a low juicy plant, even when growing upon the dry hot earth. The mildew was therefore supplied with plenty of moisture. That it seemed to thrive better the past year than before may arise from a lack of vigor in the host, so that the same or a smaller actual amount of the parasite gave more evidences of destructive work during a dry season than on an average year. On such a year as this there are greater facilities for the quick dispersion of the conidial spores. The host, being low, receives all the dews, and the dry, dust-like spores, which have been scattered during the day, germinate in the moisture of the night. Nevertheless, it is probably true that, while purslane has this year shown increased effects of the mildew, it has been due to weak host plants, and not that the dry weather has directly favored the mildew. One thing in this connection may be noted: the stems of purslane badly affected were upright, while those not showing the disease retained their normal prostrate position. It was not uncommon to see three or four badly mildewed branches standing vertical, while the more healthy portions of the plant had the ordinary spreading habit. Whether intentional or not, it is easy to see that the elevated position of the infested branches aided materially in the spreading of the spores. In walking over a piece of ground covered with purslane, the feet will hit the dusty, spore-laden, upright stems, and send the conidia to some distance. The same is, of course, true when the feet of passing animals strike the vertical branches.

To summarize: the facts of observation show that the species of *Peronosporæ* are best suited to moist weather. No member of the genus *Peronospora* has been as abundant during the last two seasons of drought as before. There was a decided decrease of mildew the past season over last year. In general, the mildews were found in early spring, while moisture abounded; after this, all through the dry rainless summer, they occurred in limited quantities, and only upon hosts in moist situations, along streams and the edges of pools. A few weeks after the refreshing September rains mildews were found in abundance upon seedling plants growing in shady places. The genus *Cystopus* seems less influenced by drought, but, as a rule, there was less of any of the species, and the infested specimens were those growing in

the best situations for obtaining moisture. In all cases when the Peronosporæ flourished it was with succulent herbs, and even with these there was probably less growth of the parasite, and sometimes a greater manifestation of disease, due to lack of resisting power in the host; so that these instances are no exception to the rule that dry weather is not advantageous for the growth of the Peronosporæ.

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BRIEFER ARTICLES.

Heinrich Anton DeBary.—Heinrich Anton DeBary, professor of botany in the University of Strassburg, and editor of the "Botanische Zeitung," died in Strassburg, after a long severe illness, on the 19th day of January.¹

Professor DeBary was born in Frankfort-on-the-Main on the 26th of January, 1831. He completed the course of study at the Gymnasium of that city, subsequently studied medicine at the universities of Heidelberg, Marburg and Berlin, and in the year 1853 entered upon the practice of medicine in his native city. During his university studies his natural inclination led him to devote much attention to botany, and it was particularly through the influence of the admirable and thorough instruction of Alexander Braun, then professor of botany at the university of Berlin, that he became specially interested in the science, which he afterward pursued with such eminent success.

In the year 1854, or when but twenty-three years of age, he became instructor (*Docent*) in botany at the university of Tübingen, and in the following year (1855) he was appointed professor of botany at the university of Freiburg in Baden, where he remained until 1867, when he accepted a similar position at the university at Halle, and in 1872 he was called to the chair of botany in the then newly opened German university of Strassburg, which position he occupied at the time of his death.

The first botanical researches of DeBary, which were published before entering upon his career as a teacher, were entitled "Beitrag zur Kenntniss der *Achlya prolifera*, Zygomyceten Familie der Pilze" (in 1852), and "Untersuchungen über die Brandpilze und die durch sie verursachten Krankheiten der Pflanzen" (in 1853). Among his larger and most widely known works may be enumerated the following: "Beiträge zur Morphologie und Physiologie der Pilze," in five parts (1864 to 1882), "Vergleichende Anatomie der Vegetationsorgane der Phanerogamen

¹ Our notice of DeBary's death in the preceding number, taken from *Pharm. Rundsch.*, is corrected as above by the announcement in *Botanische Zeitung* for January 27.—Eds.]